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December 2006

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Dorrie, DeLuca, "Virtual Teams Rethink Creativity: A New Theory Using Asynchronous Communications" (2006). *AMCIS 2006 Proceedings*. 18.
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Virtual Teams Rethink Creativity: A New Theory Using Asynchronous Communications

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ABSTRACT

A new theory, Asynchronous Creativity Theory (ACT), and a new model, the Media-Cognitive-Social Model of Creativity, are both proposed. The model takes a cross-disciplinary look at the effects of communication media capabilities on the traditional social and cognitive factors affecting creativity. The focus of the theory is on teams which use primarily asynchronous electronic communication media. Feedback is less immediate and interactions carry less language and social cues than face-to-face communications, but recent research suggests that the ultimate effects of these “losses” may serve to induce creativity. Additional features of asynchronicity – higher parallelism, rehearsability, and reprocessability – appear to enhance creativity. The net effect of the interplay of media, cognitive, and social influences is that virtual teams using asynchronous media may have greater potential for creativity than synchronous face-to-face teams. Organizational impacts could include improved innovation, cost reduction, and reshaping the structure and nature of work in organizations.

Keywords

Asynchronous Creativity Theory, Media-Cognitive-Social Model of Creativity, asynchronous electronic communication media, virtual teams.

INTRODUCTION

Most research on creativity is based on face-to-face (synchronous) interaction from a psychological trait perspective (Guilford, 1950) and a social influences perspective (Amabile, 1986). Global organizations necessarily operate in different countries with differing time zones, making face-to-face creativity costly in terms of travel and time expended. Yet for many other types of tasks, organizations would not hesitate to use e-mail, bulletin boards, file sharing and other low cost, readily available asynchronous media. As virtual teams become more successful with increasingly complex tasks, it is inevitable that creative tasks will need to occur in an environment of asynchronous communications.

Since existing creativity models have not generally considered the possibility of using asynchronous electronic communication media (AECM) for creative tasks, a more inclusive model is needed. The ways in which creative tasks are optimally approached may or may not be the same for work environments of varying synchronicity. A model is needed of the factors affecting creativity that includes previously known factors from psycho-social research and additional factors from characteristics of media of varying synchronicity. This new model will provide a more useful view of creativity using today's media and global communications environment that will be useful in developing and testing related theory.

Paulus does an extensive review of the psycho-social literature (Paulus, 2000; Paulus, Dugosh, Dzindolet, Coskun, and Putman, 2002) and as well as providing useful definitions (Paulus, 2000, p. 238):

Groups – “two or more individuals who have some interdependence or relationship and who have influence on each other through their interactions”

Teams – “groups that work together for a common goal in an organization”

Creativity – “the development of novel ideas that are useful”

Group innovation – “the actual implementation of a creative idea or product by the group.”

In the current information systems environment, asynchronous electronic communication media (AECM) (e.g. e-mail, bulletin boards) are readily available and widely used for everyday communications. Many organizations automatically assume face-to-face (FTF) is best for creative tasks, a point of view propagated by outdated theory that suggests that FTF is the “richest” medium. Recent research on process innovation (DeLuca, 2003; Kock, 2006) suggests that certain characteristics of AECM are highly desirable.

The author developed an integrative, three-dimensional model which adapts and synthesizes Paulus' constructs of social and cognitive influences on creativity and integrates them with characteristics of various media from FTF to AECM as discovered in the author's applied research on virtual team innovation (DeLuca, 2003), and other research on group innovation (Kock, 2006) and media synchronicity (DeLuca and Valacich, 2005; Dennis and Valacich, 1999).

Organizations have postponed realization of benefits obtainable by virtual teams, a situation the author aims to improve by using the new model to develop new theory. With readily-available, low cost, simple Internet-based media, virtual teams have convened either purposefully or out of necessity, realizing cost savings and "surprisingly" good results. Research indicates that factors other than media richness are important (Gasson, 2005; Ngwenyama and Lee, 1997; Williams and Edge, 1996), including social influence on media choice and convenience of the media. Compensatory Adaptation Theory (Kock, 2005b) partly explains virtual team success by demonstrating that users of convenient AECM adapt their communication behavior and effectuate some of the richness found in FTF (DeLuca, Gasson, and Kock, 2006), but the theory does not account for weaknesses of FTF media and strengths and desirability of AECM.

Research on electronic media and creativity together is primarily focused on brainstorming benefits gained through *synchronous* electronic media (Dennis and Valacich, 1993; Grise and Gallupe, 2000). There is a need for and call for theory which can explain and predict effects on creativity of dispersed teams using AECM (Hamilton, 2004; Kock, 2005a; Paulus, 2000; Weber, 2002). Asynchronous Creativity Theory (ACT), developed in this paper, contributes to filling that need.

ACT is based on this new three-dimensional model. It explains and predicts outcomes from asynchronous e-collaboration of teams, including the greater potential for creativity. The propositions of the theory are based on the linkages in the model as they apply to creativity tasks to be performed using asynchronous media.

The media-cognitive-social (MCS) model of creativity and related ACT propositions provide a framework for researchers in information systems, psychology, and sociology to perform formal testing of creative tasks performed in a relatively novel way, asynchronously. The results may apply to a variety of organizational situations. ACT has the potential to change practice, by providing a basis for breaking down the walls of reluctance of managers to use AECM for creative and/or innovation tasks.

The next section of this paper presents the MCS model of creativity and the propositions for ACT, using the constructs in the model. The limitations of ACT are expressed in terms of assumptions and boundaries in the third section. In the last section, Conclusions, consistent with the central mission of a good theory (Van de Ven, 1989), ACT contributes to knowledge on creativity of teams using AECM and applies the knowledge to developing and managing teams for organizational innovation.

MEDIA-COGNITIVE-SOCIAL MODEL OF CREATIVITY and ASYNCHRONOUS CREATIVITY THEORY

The essential constructs of ACT are shaped by the dimensions of the MCS model of creativity: media influences, cognitive influences, and social influences, all of which contribute to the generation of creative associations as shown in Figure 1. Cognitive and social influences are adapted from Paulus' summary (2000) of existing face-to-face (synchronous) research. These relationships are shown in normal text. Media influences and their relationship to cognitive and social influences and creativity make the model more applicable to teams using any media for which the media characteristics can be defined as herein. These relationships are shown in bold. A dash is used to indicate derivation from other propositions. ACT applies the model to the scope of virtual teams using asynchronous media for creative tasks. The abbreviations for the propositions of ACT are also shown on the figure.

Cognitive Influences on Creativity

Cognitive influences are summarized into three constructs: Attention (amount of focus on the task at hand), Diversity (variety of frameworks/ideas), and Incubation (time away from the task at hand). *Attention* and its detractors (production blocking, cognitive interference/load, distraction, and negative conflict) affect creativity. Idea generation may be constrained when one person is talking, the others cannot share their own ideas – production blocking (Diehl and Stroebe, 1991), although a Facilitator may serve to limit production blocking (Oxley, Dzindolet, and Paulus, 1996). A person might forget his idea (cognitive interference) while waiting or decide not to contribute it based on ensuing discussion. Information overload reduces productivity in FTF situations (Grise and Gallupe, 2000). Distractions may also take the form of side-bar conversations and negative conflict. Assuming that the human brain has limited attention resources and that distraction and the presence of others detract from those resources, then a loss of attention would mean a loss of creative ideas.

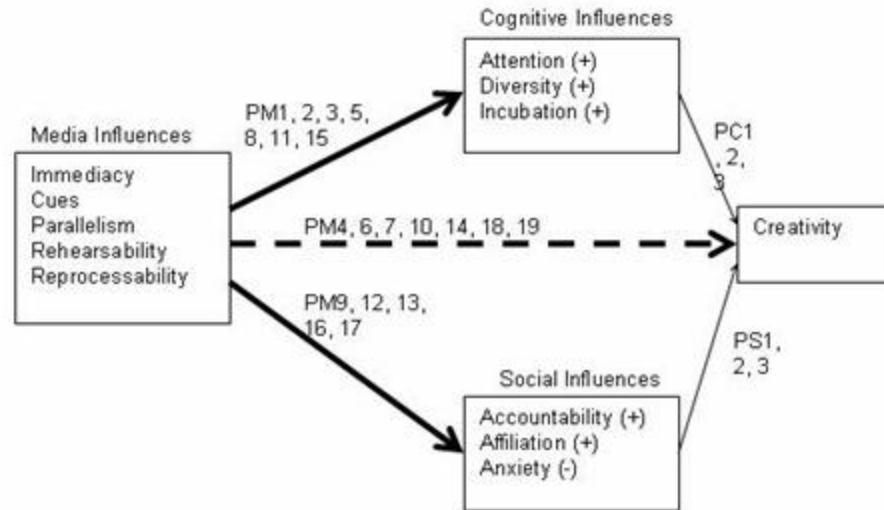


Figure 1. Media-Cognitive-Social Model of Creativity

PC1: Creativity is a positive function of Attention.

Assuming that creative ideas come from association to something else, environmental variety will facilitate associations, and more associations will mean more potential for ideas, then *Diversity* of environment and people would generally promote creativity. The majority of people believe *team* performance would be better than their *own* individual performance (Paulus, Dzindolet, Poletes, and Camacho, 1993; Stroebe et al., 1992). Diversity of team members contributes a diversity of baseline knowledge (priming), ideas, and ways of associating from which to make creative associations (Stasson and Bradshaw, 1995; Stroebe and Diehl, 1992; Dugosh and Paulus, 2005; Nagasundaram and Dennis, 1993). Diversity can contribute positive conflict through a vocal minority (Nemeth, 1995), and enhance the longevity of creativity and innovation by sustained heterogeneity (Knott, 2003) and new members (Katz, 1982).

PC2: Creativity is a positive function of Diversity.

Assuming that individuals must manage a variety of tasks and that they desire to accomplish their work tasks, having more time to manage those tasks and come back to them - *Incubation* - would promote creativity. Wallas (1926) introduces *incubation* (rest or period without conscious attention to the problem or doing other activities) and *illumination* (a “click” or “flash” of a new idea or solution often with only remote association to the problem. Csikszentmihalyi and Sawyer (1995) showed that solitary time after group interaction provided opportunity for ideas to incubate and activate related associations. Brown and Paulus (2002) and Paulus and Yang (2000) found that solitary incubation after team brainstorming produced more ideas. This author asserts the positive impacts of incubation are under-valued in their current representation in the literature, largely due to the fact that much creativity research takes place FTF where incubation is less possible. It is certainly possible that extended incubation could lead to forgetting all about it, which could be mitigated with proper timelines.

PC3: Creativity is a positive function of Incubation.

The cognitive influences in the MCS model of creativity are summarized as Attention, Diversity, and Incubation. The second dimension of the model, social influences, will be addressed next.

Social Influences on Creativity

Social influences on creativity include Accountability (a team member is associated with the quality of his/her input), Affiliation (the level of relational development of the team), and Anxiety (a sense of dis-ease). Assuming that individuals desire to accomplish their work tasks, *Accountability* (competition, meeting goals) and lack of accountability (social loafing, free riding, illusion of productivity) affect creativity. Performance is lessened when individuals loaf when in a group (Diehl and Stroebe, 1987; Paulus et al., 1993), exhibit “free riding” when others have high performance (Kerr and Bruun, 1983), or believe they are only as accountable as the lowest performers (downward social comparison) (Camacho and Paulus, 1998; Paulus and Dzindolet, 1993). Most individuals believe their group performance is up to par (Paulus, Larey, Putman, Leggett, and Roland, 1996) or perceive that their group performs better than it does (Paulus et al., 1993) (illusion of productivity). Insuring individual accountability can enhance performance (Paulus et al., 1993; Shepperd, 1993). Positive social comparison

(high standards) (Dugosh and Paulus, 2005) and feedback about performance (Paulus et al., 1996) seem to motivate accountability. Larger group size may enhance performance through competition (Paulus, 1983).

PS1: Creativity is a positive function of Accountability.

Affiliation (satisfaction, well-being) is necessary for the health of a team. Sutton and Hargadon (1996) argue for satisfaction, organizational and individual well-being as more important for creativity than production goals. Individuals seem to enjoy group brainstorming and view it positively (Paulus, Larey, and Ortega, 1995). Teams need sufficient organizational affiliation and support in terms of rewards, leadership, autonomy, and challenge (Bharadwau and Menon, 2000; Hill and Amabile, 1993; Tan, 1998; West, 1990). Socializing during a meeting may serve affiliation more than the creative task as in Distraction from Attention mentioned above.

PS2: Creativity is a positive function of Affiliation.

Anxiety (evaluation apprehension, social inhibition, status, fear, avoidance) generally inhibits creativity. Individuals who are uncomfortable with their ideas being evaluated publicly might be inhibited from sharing them (Osborn, 1957). Others might be intimidated by or defer to someone of higher status. Some individuals high in “social interaction anxiety” will contribute less because of concern about the private reaction of team members (Camacho and Paulus, 1995) or those outside the group (Diehl and Stroebe, 1987). Other may experience anxiety due to a deadline, especially a public deadline. A deadline for an asynchronous entry may not cause as much anxiety because it can be managed over a longer time period.

PS3: Creativity is a negative function of Anxiety.

The social influences dimension of the MCS model of creativity includes Accountability, Affiliation, and Anxiety influences. The third and final dimension of the model is media influences.

Media Influences on Creativity

The benefits of AECM are revealed by virtual team members DeLuca, 2003; DeLuca and Valacich, 2005), consistent with media capabilities of media of varying synchronicity (Dennis and Valacich, 1999) as adapted and summarized in Table 1.

The five media influences on creativity include: 1) *immediacy* – rapid transmission and rapid feedback from their communications; 2) *cues* – format by which information is conveyed, verbal and non-verbal language (e.g., tone, eye contact) as well as social cues (e.g., status, intimidation); 3) *parallelism* – effectively working in parallel (simultaneous conversations in process); 4) *rehearsability* – fine tuning a message before sending; and 5) *reprocessability* – readdressing a message within the context of the communication event (e.g., re-reading, printing).

AECM (e.g. e-mail) provide the opportunity to move to a different environment where one can work on something different or relax and “incubate” an idea before responding (parallelism), a characteristic that may be more desirable than immediate feedback. Note how the FTF medium and e-mail are high in opposite characteristics. This would explain the fallacy of calling one medium the “richest.” Note also how synchronous electronic conferencing, the primary media in DSS brainstorming studies, does not allow full advantage of parallelism, rehearsability, and reprocessability, thereby limiting the potentiality of creativity.

Immediacy

Immediacy promotes creativity when people’s ideas generate more ideas and those ideas can be expressed. Immediacy inhibits creativity when two people have an idea at the same time and one interferes with the other. We may be most creative in peace and quiet. Electronic brainstorming research indicates a drop-off in ideational productivity after just 6 minutes of immediacy (Howard-Jones and Murray, 2003), but the rate could be improved with techniques designed to broaden the context of thinking. Grise and Gallupe (2000) found that a synchronous electronic meeting could easily result in information overload. They designed a tool to control the rate of information to allow ideas to be organized. In a less immediate environment, this could happen naturally without the feeling of overload and without additional tools.

Organizations basing decisions on synchronous studies may come to incorrect conclusions that all media are created equal, when indeed they have different strengths and weaknesses. Information overload and/or productivity drops may not occur in asynchronous environments, at least not at the same level, because the ideas can be managed over time and the broadened contexts can come from a variety of environments over time. Many synchronous studies measure only ideation fluency, without attention to the usefulness of the ideas generated. Low immediacy allows for more integrative thinking which would improve the probability that an idea would be useful.

Media	Immediacy	Cues	Parallelism	Rehearsability	Reprocessability
Synchronous Face-to-Face	High	High	Low	Low	Low
Synchronous Video Conference	Med-high	Medium	Low	Low	Low
Synchronous Telephone Conference	High	Medium	Low	Low	Low
Synchronous Instant Messaging	Med-high	Low-med	Low-Med	Medium	Med-High
Synchronous Electronic Conferencing	Med-High	Low-med	Low-Medium	Low-med	Medium
Asynchronous Bulletin Board	Low-med	Low-med	High	High	High
Asynchronous e-mail	Low-med	Low-med	High	High	High
Asynchronous Written mail	Low	Low-med	High	High	High

Table 1. Media Capabilities

Rapid feedback as in a FTF situation may interfere with thinking, be emotionally charged, or socially stimulating, all of which creates distractions from the ideation task. As indicated by Forays and Forays (1992), “The removal of external distraction and arousal can be expected to broaden an individual’s focus of attention, accounting for the positive effects of relaxation on ideational fluency” (Howard-Jones and Murray, 2003, p. 165). Requiring immediacy may limit the number of individuals available to participate, thus limiting diversity.

PM1: Diversity is a negative function of Immediacy.

PM2: Attention is a negative function of Immediacy and Diversity.

PM3: Incubation is a negative function of Immediacy.

PM4: Creativity is a negative function of Immediacy.

Cues

Language cues promote creativity when the cues enhance the clarity of an idea and when that clarity serves to generate new ideas. Since humans are physiologically more suited to FTF communications than AECM, most language and social cues are designed for FTF delivery. *Social* cues promote creativity when they serve to recognize fruitful ideas or inhibit damaging behaviors. Social cues inhibit creativity when they intimidate. Someone who is shy or of a lower “rank” may be afraid to contribute in front of those of higher “rank” or just be shy in a group. This may be exacerbated by intimidating behaviors (e.g. “death stare,” standing over someone, disapproving gestures) and interfering behaviors (e.g. side bars). DeLuca et al. (2006) report that teams who use simple AECM adapt their communications to capture the necessary and filter the interfering.

PM5: Attention is a negative function of Social Cues.

PM6: Creativity is a positive function of Language Cues.

PM7: Creativity is a negative function of Social Cues.

Parallelism

Parallelism promotes creativity when participants can manage conflicting priorities by working on them without conflicting activity. Anytime, anyplace convenience is mentioned as a success factor by virtual teams (DeLuca and Valacich, 2005),

enabling all team members, especially managers, to participate more fully (DeLuca, 2003). Freedom around processes is cited by Amabile (1998) as a “lever to pull” for managers to intrinsically motivate creativity and likely reduces Anxiety.

Howard-Jones and Murray (2003) conclude that Incubation “may be considered as a strategy to improve productivity” (p. 165). As with the experience of receiving a sudden and unpredictable, illuminating thought long after putting aside a task aside, if an idea needs time or rest to be generated, a FTF meeting may be over. Incubation is also a factor in countering fixation (reaching an impasse) which inhibits ideation (Smith, 1995), and can be countered by a context away from previous associations (Howard-Jones and Murray, 2003), or changing between focused and unfocused modes (Amabile, 1996), which postpones convergence and allows more ideation (Amabile et al., 1986).

Parallelism contributes to Diversity by allowing more people to multi-task, thereby increasing group size. For groups of nine or more, electronic brainstorming has been shown to be superior (Dennis and Williams, 2005; Pinsonneault, Barki, Gallupe, and Hopper, 1999) to FTF.

Parallelism reduces conflict for the communication channel and thus mitigates production blocking (Murthy and Kerr, 2003) which improves Attention.

Parallelism inhibits creativity when working in parallel reduces the ability to feed off other’s ideas. “Parallelism can be a hindrance when convergence is the goal, since it is difficult to get all team members focused on a specific comment” (Murthy and Kerr, 2003, p. 353). However, parallelism may also help, when group members cannot be available at a specific moment. DeLuca and Valacich (2005) report most virtual teams are able to perform convergence tasks while using solely AECM.

PM8: Attention, Incubation, and Diversity are a positive function of Parallelism.

PM9: Anxiety is a negative function of Parallelism.

PM10: Creativity is a positive function of Parallelism.

Rehearsability

Rehearsability promotes creativity when the ability go offline to refine a contribution forms a more productive (or Accountable) contribution or when the ability to refine reduces the Anxiety of contributing “on the fly,” perhaps by Diverse group members with less language ability. Rehearsability inhibits creativity when repeating or refining takes too much energy away from other associations. The ability to rehearse may reduce Anxiety about contributing DeLuca, 2003; DeLuca et al., 2006).

PM11: Attention, Diversity, Incubation are a positive function of Rehearsability.

PM12: Accountability is a positive function of Rehearsability.

PM13: Anxiety is a negative function of Rehearsability.

PM14: Creativity is a positive function of Rehearsability.

Reprocessability

Reprocessability promotes creativity when rereading messages helps generate new ideas. Reprocessability inhibits creativity when the amount of material becomes overwhelming or the work is postponed past a period of productivity.

A distinguishing feature of AECM is “group memory” which aids in mitigating evaluation apprehension (Murthy and Kerr, 2003), which reduces Anxiety. This written (and Accountable) log of contributions serves to allow new members to “catch up” and an existing member to “listen” to all colleagues. FTF teams sometimes enhance performance by adding written or aural recording.

PM15: Attention, Diversity, and Incubation are a positive function of Reprocessability.

PM16: Accountability and Affiliation are a positive function of Reprocessability.

PM17: Anxiety is a negative function of Reprocessability.

PM18: Creativity is a positive function of Reprocessability.

The majority of the propositions above indicate that the media influences in which AECM is rated “high” are those having a positive influence on creativity. This is supported by studies where groups using computer-mediated communication were at least as good, if not better, at the creative task of idea-generation than FTF groups (Murthy and Kerr, 2003; Ocker,

Fjermestad, Hiltz, and Johnson, 1998; Kock, 2006). DeLuca (2003) found higher innovation success rates than FTF rates (Malhotra, 1998).

PM19: Creativity will be greater in groups using AECM than in groups using synchronous communications.

LIMITATIONS

The limitations on propositions derived in the previous section are expressed in terms of boundaries and assumptions. The *boundaries* of generalizability are as follows. The propositions: 1) apply to team creativity, not just individuals; 2) apply to organizations for which there is a culture of resources for innovation; 3) apply to organizations with systems, procedures, and processes to support creativity; 4) apply to organizations with low cost asynchronous communication media; 5) the communications media identifies the user of the media; 6) do Not take into account different skill levels for creativity; 7) do Not take into account training to be more creative, but could have implications for training; 8) apply to an organization using a communication medium in which symbols available in the medium are sufficient to express ideas; and 9) apply to an organization in which the nature of the project is such that the time needed for asynchronous communications will not impact the project.

The *assumptions* that justify a theory “include the implicit values of the theorist and the often explicit restrictions regarding space and time” (Bacharach, 1989, p. 498) as well as the psychological, economic, and sociological factors that justify the constructs and propositions. The assumptions for ACT are: 1) Individual team members desire to accomplish their work tasks; 2) Individual team members must manage a variety tasks in daily work; 3) The human brain has limited attention resources; 4) Distraction consumes attention resources; 5) Individuals are distracted by the presence of each other; 6) Humans are physiologically more suited to FTF communications than AECM; 7) There is nothing new under the sun (creative ideas come from association to something else); 8) Environmental variety will facilitate associations; and 9) More associations mean more potential for ideas.

CONCLUSIONS

A new theory, Asynchronous Creativity Theory (ACT), is proposed. The main proposition of the theory is that teams which use asynchronous electronic communications media (AECM) have greater creativity than team which use synchronous media. This theory helps explain the results from studies on successful virtual teams, a success that is not anticipated by traditional theories.

ACT is based on a new model of creativity, which is also proposed, the Media-Cognitive-Social Model of Creativity. The model takes a cross-disciplinary look at the effects of five characteristics of communication media on three cognitive and three social factors traditionally viewed as affecting creativity. The focus here is applying the model to create a theory of creativity for teams which use primarily asynchronous electronic communication media. The three-dimensional model provides great potential as a basis for theory development relevant to business, psychology, and sociology.

This paper meets criteria for new theory with the parsimonious organization provided by the MCS model of creativity and by clearly communicating the constructs and propositions (Bacharach, 1989). ACT is a viable theory based on the two criteria for evaluating a theory (Bacharach, 1989, p. 500): 1) its propositions can be *falsified* through operationalization and test; and 2) it has *utility* by *explaining* the relationships among the constructs in the MCS model of creativity, and predictions made favorably compare to the empirical evidence.

AECM are used routinely for transmittal of information, but are less often considered for tasks requiring creativity, probably because, compared to traditional FTF communications, feedback is less immediate and interactions carry less language and social cues. Yet the ultimate effects of these AECM “disadvantages” may serve to induce creativity by: 1) reducing distraction from Attention on the task; and 2) reducing Anxiety caused by status, fear, intimidation, extraneous socializing, or avoidance.

ACT contends that compensations must be made for using any media, but for creative tasks, we may actually need to compensate *more* when we *are* FTF than when we *are not*. Parallelism, Rehearsability, and Reprocessability characteristics of media appear to be more important to the creative process than Immediacy and Cues, and appear to enhance creativity by: 1) increasing Attention to the task because other work can be set aside; 2) increasing Diversity of potential team members; 3) allowing for rest and Incubation of thoughts; 4) providing written Accountability; 5) increasing Affiliation with more team members; 6) re-readable (Reprocessable) input; 7) reduced Anxiety from delivering an idea because it can first be refined and Rehearsed; and 8) providing the motivation of the additional freedom of anytime, anyplace communications (Parallelism).

Asynchronous Creativity Theory is a significant contribution to multi-disciplinary creativity research. The final proposition is a succinct summary of the contribution of the theory, that asynchronous media may indeed be better for creativity tasks than the traditional synchronous media. The details of the other propositions may be applied to any media by analyzing its characteristics and their effects on creativity, thereby explaining more variance than any known theory.

ACT has potential to impact organizations by encouraging use of AECM for creative teams, thereby reducing travel and time expenditures, and reshaping the structure and nature of innovation in organizations, especially global and/or 24/7 organizations. Understanding the interplay of the three dimensions of the model also provides cautionary insight into the influences affecting creativity in virtual teams for considerations unique to each environment. Empirical testing of the explicit propositions of ACT is invited.

ACKNOWLEDGEMENTS

The author would like to gratefully acknowledge the support of a University of Delaware General University Research (GUR) grant for development of the Asynchronous Creativity Theory.

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